XR 300

SMPTE-MIDI & SMPTE-MTC SYNCHRONISER

OWNERS MANUAL

XRI Systems

XR300 USERS MANUAL

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Set clock pulse rate MIDI+DIN	Stripe tape	Set initial tempo/time signature delay	Set initial MIDI clock delay	Merges input MIDI	Load or dump
		Set tempo changes and bars		(stop tape) Displays current time code Sends MIDI stop	
EXIT	EXIT	EXIT	EXIT EXIT	EXIT (or repeat)	EXIT

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INTRODUCTION

The XR300 is a dedicated micro computer which functions as the central control station of any recording system using audio tape and MIDI sequencer recording techniques and drum machines. It will prove invaluable in any MIDI/multi-track recording set up from home music systems to professional studios because it provides full compatibility between SMPTE and MIDI.

The XR300 both reads and writes a selection of standard time codes and sends MIDI clock, start, stop and song position pointer information in accordance with the MIDI 1.0 Spec. Time code type, tempo and start times can all be defined as well as synchronisation delays and inflight tempo changes. Even MIDI and DIN clock sync. can be changed to 24, 48, or 96 ppqn. to suit non standard equipment.

The following pages explain how to set up, program and use the XR300. The 'Quick User Guide' will be useful once you are familiar with the functions available.
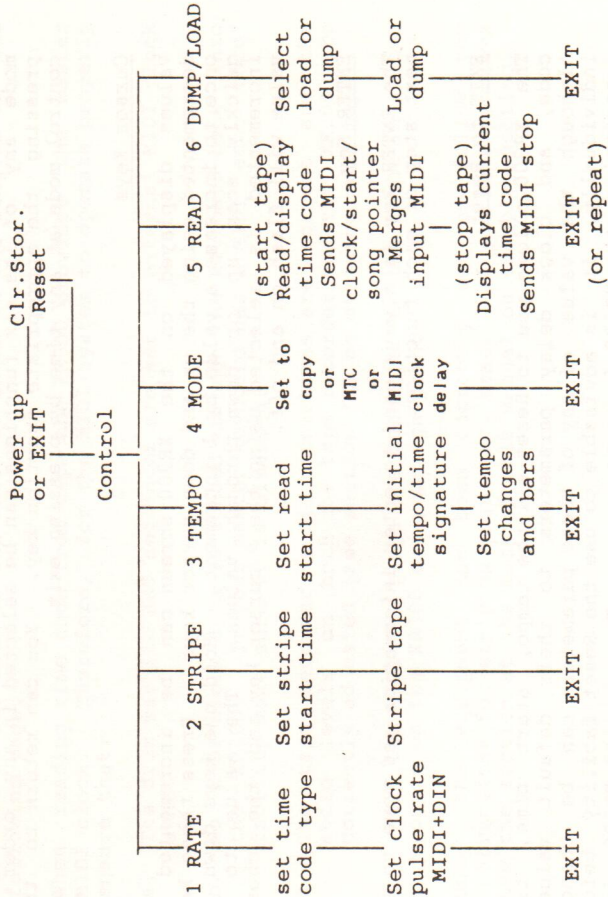
HOW IT WORKS

The XR300 is first used to stripe one track of audio tape with SMPTE time code. It then reads back the time code and generates MIDI control codes as you play the tape. These MIDI codes will then control any sequencers or drum machines connected to the XR300 and keep them synchronised and co-located with music subsequently recorded on any other of the tape recorder tracks.

Once the system is set up and operating the XR300 will carry on providing master clock, start, stop, and auto-locate MIDI control codes continuously and automatically as you start, stop, rewind, fast forward, and restart your tape recorder. Now you can record more music on both audio tape tracks and sequencer tracks, building up a complete composition - half recorded on tape and half played live from drum machines and keyboards (via the sequencer).

The XR300 will allow you to make full use of your sequencer and multi-tracker by recording, overdubbing, punching-in, and even mixing down from both machines together.

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SYSTEM SET UP

The XR300 should be central to your MIDI set up. Make the connections from your external equipment to the MIDI and audio sockets in the back of the XR300 as shown in the diagram on the following page.
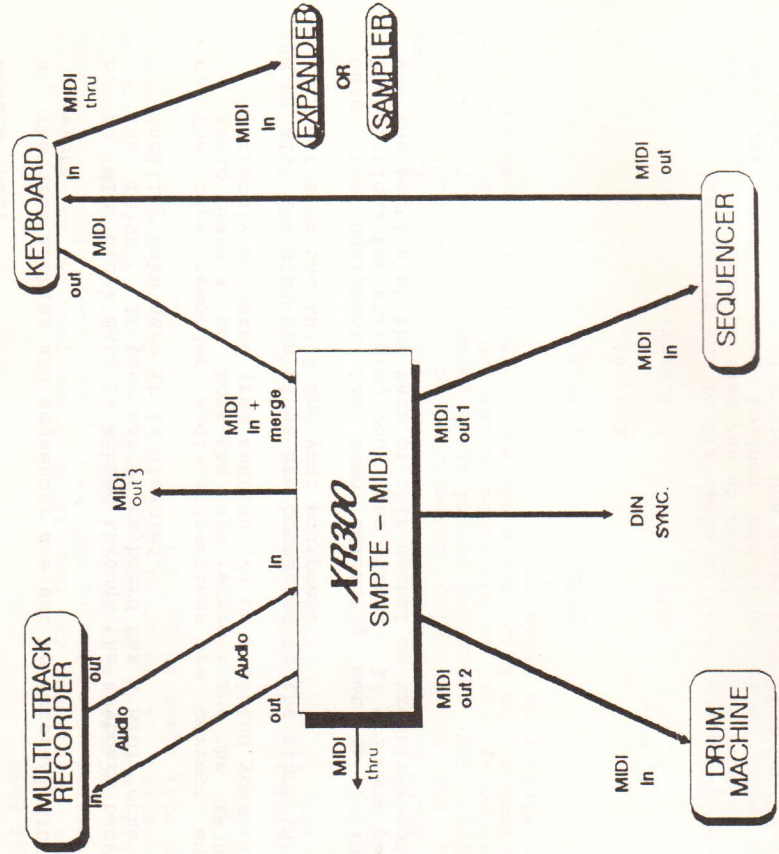
When reading time code from tape the XR300 provides the master MIDI clock. Therefore, for the MIDI system to operate properly ensure that:

a. The drum machine and sequencer are set to external MIDI clock sync.

b. No MIDI clock data is echoed through the keyboard back into the XR300. If your master keyboard has a MIDI "echo thru" facility make sure it is disabled.

c. The tape recorder audio connections are correct and the audio levels on both the tape recorder and the XR300 are correctly adjusted (see section (2) on striping your tape).

d. All the MIDI Din plugs are connected to the right in's and out's on the XR300 and your equipment.

Once the equipment has been correctly set up follow the instructions for striping your sync. track. If you have problems see the section at the back of this manual on trouble-shooting.

SETTING UP THE XR300

Control Mode

When you switch on the XR300 it is in control mode. From this mode any of its six functions can be selected in any order by pressing the appropriate function key. You can return to this control mode at any time by pressing exit.

Cursor Keys

Values displayed on the XR300 screen can be incremented or decremented using the up and down cursor keys. Press these keys once to increase a value by 1 increment. Hold the keys down to quickly scan up or down through values. The value to be incremented is selected using the > cursor key and the chosen value will flash on and off.

ENTER Key

The ENTER key is always used to enter information and move to the next step of each function.

EXIT to Reset

The XR300 allows you to Reset all the tempo, start time, time code, and clock delay parameters to their default values. Although the value of any of these parameters can be changed individually, it is advisable to use the Reset facility before programming the XR300 for a new song. To reset the XR300 from the control mode press exit.

PRESS	DISPLAY
	Control.
EXIT	Clr.Stor.

The XR300 is now ready to clear all of the stored parameters to their default value. If you do not want to reset the XR300 now, press exit to return to the control mode. Otherwise, press enter. The XR300 will reset and return to the control mode.

<u>FUNCTION (1) RATE</u>

This function allows you to select what type of time code is striped onto your tape. There are four rates to choose from:

SMPTE   30 Frames per sec
FILM   24 Frames per sec
EBU   25 Frames per sec
DROP FRAME (correcting for 29.97 Fr/s)

It is important to ensure that this rate is set to read the correct time code from tape that has previously been striped, otherwise timing synchronisation errors will occur.

To set the time code

PRESS	DISPLAY
	Control.
RATE	Alt-t.cod
ENTER	24.25.30.dF

One of the displayed time codes will flash. Use the cursor key to flash the desired time code and press enter.

ENTER	PULSES

The XR300 now allows you to define a pulse per quarter note clock rate (ppqn) for the MIDI and Din sync. clock outputs. Usually this will be left at 24ppqn, the standard clock rate for Roland and Yamaha. Two higher clock rates can be selected for synchronising to non-standard equipment. Press enter

ENTER	.96 .48 .24

Select the desired clock rate using the > cursor key and press enter to return to the control mode.

ENTER	Control.

THE XR300 SYSTEM SET UP

NFI Systems Design

FUNCTION (2) STRIPE

This function allows your to set the tape stripe start time, and to stripe your audio tape with the time code.

```
PRESS      DISPLAY
STRIPE     t.cod-out
           hrs min sec frame
ENTER      00.00.00.01
```

The start time now displayed will be as shown above. This will be the very first time to be written onto your tape and consequently the first time to be read off. The stripe start time is normally left at one frame, but if you want to change it use the cursor and increment keys.

Before actually striping your tape it is best to set the audio levels into your tape recorder. With the desired start time displayed, set your audio tape recorder to 'record pause' and press enter on the XR300.

```
ENTER      00.00.05.21  (incrementing)
                |
           STRIPE indicator (flashing)
```

If the tape recorder input is being monitored you should now hear the SMPTE code generated by the XR300 and see a reading on the input VU level indicator on your tape recorder. Now adjust the output level on the XR300 to about midway and adjust the input VU level on your recorder to between -5 and -7 VU. The input and output levels are not too critical but a low level sync. track recording is least likely to cross-talk to other tracks. Once the levels have been set correctly, press enter to return to the Control mode and repeat the above steps - this time recording the sync. track for real.

Your audio tape track will be time coded continuously, and the incrementing time code is displayed. When you have striped the desired length of audio tape press EXIT to return to the control mode.

Notes on recording the SMPTE time code

1. During tape striping no MIDI or din clock functions operate.

2. When using Drop Frame type time codes, ensure that the start time chosen is actually allowed by the D.F. standard. Do not select the first 2 frames in each new minute (except for the 10th, 20th, 30th minute etc.)

   eg. 00.01.00.01 not allowed
       00.01.02.01 allowed
       00.20.00.01 allowed

3. Make a note of the tape count on your tape machine at the beginning and end of the striped section of tape. It is important that at least 30 secs of tape is erased clear infront of and behind the stripe. This avoids reading errors later on. Ensure this by starting the tape recorder before starting the stripe function, and stopping the stripe function before stopping the tape recorded.

4. The SMPTE time code will record using Dolby B, C or DBX on any type of audio tape as long as VU levels are adjusted correctly.

5. To avoid misreading of the time code ensure that audio lines between the XR300 and tape recorder are direct and not subject to any EQ. or effects processing. The time code signals may pass through a mixer providing they are not greatly attenuated or equalised.

6. The XR300 will synchronise to variable speed tape recorders. To ensure maximum speed variation later on record the SMPTE time code with varispeed set to its mid postion.

FUNCTION (3) TEMPO

This function allows you to set the time at which the XR300 will start generating MIDI from the incoming time code (from your tape) and the initial tempo of MIDI clock data. It also allows you to define MIDI tempo changes at particular bars throughout the generated MIDI stream.

PRESS	DISPLAY
TEMPO	Strt - At
ENTER	00.00.01.00

The start time now displayed will be as shown above, or the value last set on the XR300. This time will be the point at which the XR300 automatically generates a MIDI start command to start up all the sequencers and drum machines in your system. The XR300 requires a short time before this point to lock-in to the time code so make sure that the start time you set here is at least 5 frames ahead of the start time you set during the STRIPE function. Use the up and down cursor keys to set the start time and press enter to move to the next step.

ENTER	Stor 01
ENTER	120.16.250
	BPM Tsig Bars

This is the default tempo setting of 120 Beats per minute lasting for 250 bars, with a time signature code of 16. Any of these settings can be changed using the cursor keys. Change the time signature in accordance with the table below.

Time signature	XR300 Display	Time signature	XR300 Display
1/16	1	17/16	17
1/8	2	9/8	18
3/16	3	19/16	19
1/4	4	5/4	20
5/16	5	21/16	21
3/8	6	11/8	22
7/16	7	23/16	23
2/4	8	6/4	24
9/16	9	25/16	25
5/8	10	13/8	26
11/16	11	27/16	27
3/4	12	7/4	28
13/16	13	29/16	29
7/8	14	15/8	30
15/16	15	31/16	31
4/4 (default)	16	8/4	32

The initial tempo and time signature is stored as 'store 01' and will play for the set number of bars and then stop. If no inflight tempo changes are required press exit to return to the control mode. Otherwise press enter.

ENTER	Stor	02
ENTER	120.16.000	

The default level of the second Tempo setting is displayed. Now use the cursor keys to set the second Tempo setting and the number of bars it will last for. If the initial Tempo setting was set to last for 250 bars, the next Tempo setting (store 02) will operate at the beginning of the 251st bar of your song. Press enter to set further Tempo changes in the same way.

Note that the number of bars set in total for all Tempo settings determines the overall length of the song, after which MIDI stop data is sent. If the song consists of more than 250 bars at the same Tempo setting, simply set the next Tempo setting to the same value. Up to 10 Tempo settings are available giving you a maximum song length of $10 \times 250 = 2500$ bars. When all the required inflight Tempo changes have been set press EXIT to return to the control mode. Note that any of the Tempo settings can be changed individually at any time by using the enter key to scan through to the desired setting.

FUNCTION (4) MODE

a) Copy Mode.

You can use the XR300 to restripe audio SMPTE codes. This is useful for recording codes from one tape machine (or video player) to another, or for recording from one track to another on the same machine. The XR300 will read in code from the TAPE-in socket, reshape it, and send out a new, clean SMPTE code from the TAPE-out socket. This may also help retreive codes with small drop outs or varying audio levels.

To enter copy mode from the control display press the MODE key, use the cursor key to select copy, then press enter.

PRESS	DISPLAY	
MODE	no	COPY
>	no	COPY
ENTER	COPYING	

The XR300 will now copy whatever time codes are sent to it (there is no need to set the RATE function to match), but no SMPTE times are displayed. Set the SMPTE level control as high as possible and monitor/adjust the output level to be recorded on your tape recorder. To exit copy mode simply press the exit key.

b) dtl Mode (MTC).

The MODE function is also used to set the XR300 to convert SMPTE to MIDI Time Code (MTC) instead of conventional MIDI clocks. If your sequencer accepts the new MTC standard we suggest you use this mode exclusively (see the additional notes for MTC users at the back of this manual).

PRESS	DISPLAY
MODE	no COPY
ENTER	dtl.oFF.on
>	dtl.oFF.on
ENTER	dt-loc

Press the MODE key then press enter so that the display shows dtl (direct time lock) with 'oFF' flashing. Use the cursor key to make 'on' flash and press enter. This puts the XR300 into direct time lock mode ready to receive SMPTE and output corresponding MTC. You can press exit to return to the control mode display but the XR300 remains in dtl mode, even when you switch off the unit. From the control display you can use the STRIPE, RATE, COPY and READ functions as normal, but TEMPO, Start time, dump/load and delay are inoperative. You should be able to set all of these parameters on your sequencer.

To exit dtl mode from the control display press MODE, enter, and then select dtl off. Enter through the delay set up to return to the control display for normal XR300 operation.

PRESS	DISPLAY
MODE	no COPY
ENTER	dtl.oFF.on
>	dtl.oFF.on

While in dtl mode the XR300 only merges through keyboard data when set to read (ie dt-loc). When moving from normal MIDI clock mode to dtl mode all of the XR300's internal settings are lost. The XR300 powers up displaying dt-loc rather than Control to let you know that it is in dtl mode.

c) Delay Mode.

This function allows you to introduce a delay or advance in synchronisation between the time code read off your audio tape and the MIDI clock generated (it cannot be set in dtl mode). It is useful for spreading MIDI events slightly to thicken sounds or create echo effects between sequenced and recorded music.

PRESS	DISPLAY
MODE	no COPY
ENTER	dtl.oFF.on
ENTER	d1A. 00

The display shows either a default delay level of 0 bits or that delay level previously set on the XR300. This value can now be incremented up to 79 bits. Each bit represents approxiamately 1/2 millisecond delay giving a total of 40 ms. There are 80 bits per frame and up to 30 frames per second (depending on the rate chosen).

The total delay/advance time between recorded and sequenced music may be increased to any value by changing the start time set within the TEMPO function. The Mode function allows you to finely adjust this delay/advance with a resolution of 1/80th of a frame. Use the increment keys to introduce delay as required. Press exit to return to the control mode.

FUNCTION (5) READ

This function puts the XR300 into its usual working mode where it locks onto and displays incoming audio tape time codes, and generates MIDI data and DIN clock sync. During this function incoming MIDI data (from your keyboard for example) is merged with MIDI clock and start/stop commands generated by the XR300 and transmitted to each of the 3 outputs. Press READ

PRESS	DISPLAY
READ	t.code-in
ENTER	Auto - loc

(start audio tape)	00.00.12.18 (incrementing)
	||
	T.ERR READ

As soon as the XR300 receives time code it is displayed in hrs, mins, seconds and frames. When the start time set during the TEMPO function is reached the XR300 generates MIDI start and clock data to start your sequencer/drum machine. At this point the dot displayed above "READ" flashes to indicate that midi clock has started. Any tape errors in the incoming time code are also indicated in the display (T.ERR) but tape drop outs of short durations will not effect the performance of the XR300. MIDI clock data will be continuously generated until either the total number of bars (as set during the TEMPO function) have been played, or the time coded audio tape is stopped.

(stop audio tape)	00.06.13.23

When incoming time code is stopped the last received value is displayed and the XR300 transmits MIDI stop commands to your sequencer/drum machines. The audio tape can now be fast forwarded or rewound to any point that has been time code striped (note the tape counter points on your tape machine as recorded during the STRIPE function) Restart the tape.

(start audio tape)	00.02.01.42 (incrementing)

The XR300 now displays the new time code and if this is beyond the start time as set during the TEMPO function, the following data is generated.

a) MIDI song position pointer commands
b) MIDI start commands
c) MIDI clock at correct Tempo
d) DIN clock

From the received time code the XR300 works out whereabouts in the song you are and what Tempo has been set for that particular bar in the song. Your drum machine and sequenceer are then sent MIDI song position pointer messages to tell them where to start from. After one or two seconds delay for calculating, MIDI start and clock are generated at the correct Tempo and both recorded and sequenced music will play synchronized to the right place in your song. The audio tape may now be stopped / rewound / fast forwarded and started as desired and the XR300 will continue to synchronise your music.

You can press exit at any time to return to the control mode but the XR300 should be left in the READ mode during all your music recording to keep everything synchronised. Infact you should now find that all the start, stop and auto-locate functions on the sequencer can now be executed from your recorders tape transport mechanism. The MIDI input from your keyboard is merged with MIDI clock data from the XR300 and echoed through to each of the 3 MIDI outputs for sequencer recording.

If you varispeed your tape recorder you will hear the drum machine or sequencer slow down or speed up in simpathy. A speed variation of more than 30% can be used before reading to errors occur.

Try recording a sequence of drum patterns synchronised by the XR300 and then playing back the recorded drums against a different sequence of patterns played back live from the drum machine. Add one or two sequencer keyboard tracks and some vocals and guitar on tape and you will soon discover how useful the system can be.

If the XR300 is not reading back SMPTE clearly and continuously adjust its input level control or the tape recorders sync. track output level. If reading errors persist see the section on trouble-shooting at the back of this manual.

FUNCTION (6) DUMP/LOAD

The DUMP/LOAD function allows you to save all the XR300's settings for a particular song to any standard MIDI sequencer for retrieval at a later date. Press the DP/LD key.

PRESS	DISPLAY	
DP/LD	Stor - Lod	(select)
ENTER	Stor	(set to record)
or	Lod	(start play back)

Use the cursor key to select whether you want to dump the settings currently on the XR300 (Store) or load settings previously saved on your sequencer (Load).

To dump the current settings, set your MIDI sequencer to record and press enter. The XR300 will automatically start and stop the very short sequencer recording. To load settings first move your MIDI cables so that the sequencer output directly connects to the XR300 input. Select load, press enter and begin play back from your sequencer. When either operation is complete (after one or two seconds) the XR300 will display End. Press exit to return to the Control mode.

ENTER	End	(when information sent or received)
EXIT	Control.	

For MIDI dump to operate successfully you must ensure that your sequencer is capable of recording system exclusive information. If your sequencer has this facility make sure that it is enabled. When loading data the existing XR300 settings are lost - so save them first if you want them. NB.The sequencer must be on ext. midi sync when dumping.

BATTERY BACK UP

The XR300 is equipped with the facility to save all of its settings in internal memory for a up to one month. The internal batteries are continually recharged during use so that settings should never be lost as long as the XR300 is in regular use. However when the XR300 is first used the batteries may be in a low charge state and internal settings may be lost. This is indicated by a flashing display when you switch it on.

(switch on)   Clr.Stor. (flashing)

ENTER   Control

Simply press enter to reset the internal settings.

TROUBLE SHOOTING

The basic principals of MIDI are quite straight forward but once you build up to a reasonably sized system even the best of us start making mistakes and getting confused. If some part of your system is not functioning as it should then nine times out of ten it will be caused by some human error rather than faulty gear. So before you pack up your suspected latest purchase and send it back to the shop, look closely at your MIDI set up and try to trace the fault back so as to illiminate all of the countless other things that could be causing it.

If you are new to MIDI mania, here are a few tips to help:

a. Be organised. Before you start making any connections put all your keyboards, sequencers, drum machines, etc. on good solid stands or a table top in the positions you want them to end up so as to be in easy reach when you are using them.

b. Make a quick sketch of all your equipment and draw on all the MIDI and audio connections you will need. When you are happy with the diagram tick off the connections as you make them.

c. Label all your MIDI and audio leads at both ends. Use different coloured leads if you can get them.

d. Make sure all the MIDI out's and thru's are connected to MIDI in's or not at all. Equipment MIDI markings are usually small and hidden on back panels. Stick on bright, clear labels where you can see them.

e. Know your equipment. Read the manual thoroughly to find out exactly what it can and cannot do. Make sure you have programmed your equipment to send and receive the right MIDI data and to respond in the right way.

If you have problems with the XR300 the following table should lead you to the likely cause.

XR300 SET UP TROUBLE SHOOTING

FAULT	LIKELY CAUSES
XR300 stripe display incrementing but no striping code audible.	Audio lead faulty or wrongly connected. Tape recorder input switched out or not monitored. XR300 level or tape input level too low.
XR300 displaying 'Auto-loc' but not reading time code from tape.	Audio lead faulty or wrongly connected. XR300 level or tape output too low. Tape stopped or playing before/after striped section of tape.
XR300 reading increment-ing time code but not con-tinuosly or consistantly	Faulty audio leads. Time code output from tape mixed with music on other tracks or mixer inputs. Time code on tape corrupted over EQ'ed. Bad drop outs on audio tape. Time code being read before or after striped section from unclean tape.
MIDI drum machine or seq-uencer not responding to XR300 data.	Faulty or wrongly connected MIDI leads. Drum machine or sequencer not programmed correctly or ready to recieve MIDI data commands. MIDI data from XR300 corrupted by MIDI equipment between XR300 and seq./d.m. Tape played from beyond start time set during TEMPO function.
Seq./d.m. responding to XR300 data but incorrectly or not synchronized with recorded tracks.	Seq./d.m. not programmed correctly to receive external MIDI clock. MIDI clock from XR300 echoed back into the XR300 via the seq./keyboard set up. RATE function not set correctly to read the right time code off tape. MODE function on XR300 programmed to give unintensional delay. TEMPO function not programmed to give the right tempo/time siginture/number of bars.
Sequencer or drum machine stops before tape or recorded tracks stop.	End of song pattern reached on seq./d.m. End of bars set during TEMPO function. End of striped section on tape reached. Exit pressed or power cut on XR300. MIDI cables disconnected.
Sequencer and drum machine start with tape but at wrong place in song.	Seq./d.m. not programmed to receive song pointer information. Start time or tempo changes not set correctly during TEMPO function. Sequencer tracks incorrectly recorded.

MIDI IMPLEMENTATION CHART

DATE: 2/12/87
VERSION: 2.1

[SMPTE - MIDI CONVERTER]
Model XR300   MIDI IMPLEMENTATION CHART

FUNCTION		TRANSMITTED	RECOGNIZED	REMARKS
Basic Channel	Default	1-16	1-16	merges input to outputs
Mode	Default	1	1	
	Messages	X	X	
	Altered	X	X	
Note Number		X	X	
Velocity	Note ON	X	X	
	Note OFF	X	X	
After Touch	Keys	X	X	
	Channels	X	X	
Pitch Bender		X	X	
Control		X	X	
Change				
Program Change		X	X	
System Exclusive		O	O	(1) all settings
System: Song Pos		O	X	(2)
Song Sel		X	X	
Common: Time		X	X	
System: Clock		O	X	(2) Transmits MTC (optional)
Real Time: Commands		O	X	
Aux: Local ON/OFF		X	X	
All Notes OFF		X	X	
Messages: Active Sense		X	X	
Reset		X	X	

NOTES   (1) System exclusive only received during LOAD procedure
        (2) System information must not be received from outputs

Mode 1 : OMNI ON, POLY   Mode 2 : OMNI ON, MONO   O YES
Mode 3 : OMNI OFF, POLY   Mode 4 : OMNI OFF, MONO   X NO

XR300 SPECIFICATIONS

Maximum Auto-locate time
  without tempo changes...............1 second
  with tempo chages...................2 seconds
  typical auto-locate time............1/2 second

Time codes supported................24 frames per sec
                                     25 frames per sec
                                     30 frames per sec
                    Drop Frame (29.97 fr/sec)

MIDI/DIN clock rates supported...........96, 48, 24 ppqn
                                          (default 24)

Time signatures assignable......any between 1/16 and 32/16
                                 (default 4/4)

Tempo changes programmable inflight.................10

MIDI connections..................1 IN, 1 THRU and 3 OUTS

Stripe recording level recommended........-7 to -10 VU

Stripe output level variation.........0.5 to 4.5 Volts p-p

Minimum stripe input level............1 Volt p-p

Input impedance.......................75 ohm unbalanced

Output impedance......................75 ohm unbalanced

Power consumption..............approx. 0.05 Amps at 240V

Power supply voltages available......240 or 120 Volts A.C.

Battery back up time...............approx 1 month

Mounting type......................19 inch standard

Dimensions.........................470 X 240 X 44 mm

Weight.............................approx. 4kg

Synchronisation methods ......MIDI clock + SPP + start/stop commands
                         ....MIDI Time Code (direct time lock)
                         ....Copy time code (reshape stripe)

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Notes for MIDI Time Code users.

Using direct time lock the XR300 converts SMPTE from tape into MTC to which most sequencers can be set to respond. In this mode the XR300 will not output normal MIDI clocks and SPP, so you must ensure that your sequencer understands MTC and is set to synchronise to it.

As yet, very few hardware MIDI devices accept MTC, but many software sequencers do. The usual method is to use the XR300 to send MTC to the sequencer where the correct tempo is determined according to the parameters set. The sequencer then plays along in time with the tape, and outputs MIDI clocks and song position pointers to MIDI devices throughout the rest of the system.

Be careful when using MIDI merge or thru boxes because some MIDI modules get very confused if they receive MTC, normal MIDI clocks and keyboard data all at once. The XR400 MIDI Mate (automatic merge and MIDI routing rack box) uses internal software specifically designed to avoid problems with MTC and MIDI clocks when configuring MIDI systems (details from XRI Systems)

Most American MAC-based sequencers (eg. Dr.T's KCS, Passports MTP, Performer etc.) have a standard synchronisation page from which you can select MTC external sync and then program in SMPTE start time, tempo, tempo changes and offset (delay) as required. Consult your sequencer manual for instructions. If your sequencer version does not seem to have an MTC option ask the manufacturer / distributor for updates and advice. European sequencers can be a little more complicated to set up. For example, to synchronise Steinbergs Cubase program follow this procedure:

For normal MIDI sync to XR300 (MIDI clocks)

1) Enable SYNC (black) at the bottom right corner of the main screen, and disable MASTER (white) just above that.

2) Go into the Sync page (options menu). Set the tempo sync box to MIDI clock and the send sync box to MIDI clock (tick).

Cubase will respond to incoming clock (from the XR300) and will revert to its own internal clock if started without an incoming MIDI clock signal.

For MIDI Time Code operation (dtl)

1) Enable SYNC and MASTER on the main page (both black).

2) Go into the Sync page and set the SMPTE sync box to MIDI Time Code, the send sync box to MIDI clock and set the SMPTE offset (start time).

3) Go into Master track (Edit menu) and set up a tempo map. Then start the XR300 in MTC mode and Cubase should autoloc as set.

For Human Sync in dtl mode

1) Go to the sync page, set the Tempo sync box to human sync and advance the offset time by about 20 secs.

2) Enable tempo record (options menu), disable MASTER on the main page and select a track to record.

3) Begin recording (Cubase should wait for you to start the tape) with the XR300 in MTC mode.

4) Tap input 4 notes in time with the intro click track on tape, the sequenced music will start on the 5th note, but carry on tapping in time with the tape recorded music throughout the song.

5) To play back the sequence and tape together readjust the SMPTE offset time and enable MASTER (black) before starting the tape.